



STATE OF WASHINGTON

## STATE BUILDING CODE COUNCIL

### 2021 Washington State Energy Code Development Energy Code Proposal Short Form

For editorial **Coordination, Clarifications & Corrections** only,  
without substantive energy or cost impacts

Log No. **110**  
**TAG Revision 7/23/21**

Code being amended: ☒ **Commercial** Provisions ☐ **Residential** Provisions  
(A MS Word version of the code is linked to the name)

Code Section # **C202, C403.3.5.1, C403.3.5.2, C403.3.5.3, C403.3.5.4, C406.7**

Brief Description:

**This proposal addresses three issues related to DOAS fan power.**

**#1 - The current language in Section C403.3.5.1 Energy recovery ventilation with DOAS includes two distinct requirements for energy recovery performance and maximum allowed fan power. This proposal separates these requirements into two sections.**

**#2 - Language in current Sections C403.3.5.1, C403.3.5.2 and C406.7 refer to the fan performance metric “W/cfm” and “watts per cfm”. There is no reference standard and it is unclear how this value is calculated. This proposal adds a calculation procedure that is based upon the methodology for determining fan performance in ASHRAE Standard 90.1-2019, Appendix G. This also aligns with the calculation procedure applied in TSPR.**

**#3 - Sections C403.3.5.1 and C406.7 are inconsistent with regards to which fans shall be included in the DOAS watts per cfm calculation. This proposal clarifies that destratification fans are not to be included.**

**This proposal provides a general definition for DOAS that aligns with all references to DOAS in this code.**

**This proposal also corrects an error in the DOAS fan power requirement where the assignment of performance criteria for fans that are exactly 5 hp had been omitted.**

Proposed code change text: (Copy the existing text from the Integrated Draft, linked above, and then use underline for new text and ~~strikeout~~ for text to be deleted.)

#### **SECTION C202 - GENERAL DEFINITIONS**

**DEDICATED OUTDOOR AIR SYSTEM (DOAS).** A ventilation system that supplies 100 percent outdoor air primarily for the purpose of ventilation and that is a separate system from the zone space-conditioning system.

**C403.3.5.1 DOAS with energy recovery ventilation with DOAS.** The DOAS shall include energy recovery ventilation. The energy recovery system shall have a 60 percent minimum sensible recovery effectiveness or have 50 percent enthalpy recovery effectiveness in accordance with Section C403.7.6.

**[NOTE – Move this language to new section below.]** For DOAS having a total fan system motor nameplate hp less than 5 hp, total combined fan power shall not exceed 1 W/cfm of outdoor air. For DOAS having a total fan system motor hp greater than or equal to 5 hp, refer to fan power limitations of Section C403.8.1. This fan power restriction applies to each dedicated outdoor air unit in the permitted project, but does not include the fan power associated with the zonal heating/cooling equipment.

The airflow rate thresholds for energy recovery requirements in Tables C403.7.6(1) and C403.7.6(2) do not apply.

**Exceptions:**

1. Occupied spaces with all of the following characteristics: complying with Section C403.7.6, served by equipment less than 5000 cfm, with an average occupant load greater than 25 people per 1000 square feet (93 m<sup>2</sup>) of floor area (as established in Table 403.3.1.1 of the International Mechanical Code) that include demand control ventilation configured to reduce outdoor air by at least 50% below design minimum ventilation rates when the actual occupancy of the space served by the system is less than the design occupancy.
2. Systems installed for the sole purpose of providing makeup air for systems exhausting toxic, flammable, paint, or corrosive fumes or dust, dryer exhaust, or commercial kitchen hoods used for collecting and removing grease vapors and smoke.

*[NOTE – Moved language with proposed edits.]*

*[NOTE – Moved language with proposed edits.]*

**C403.3.5.2 DOAS fan power.** For a DOAS ~~having a total fan system motor nameplate hp less than 5 hp, that does not have at least one fan or fan array with fan electrical input power  $\geq 1$  kW, the~~ total combined fan power shall not exceed 1 W/cfm watt per cfm of outdoor air as calculated in accordance with Equation 4-X using design maximum airflows and external static pressures. For a DOAS ~~having a total fan system motor hp greater than 5 hp, with at least one fan or fan array with fan electrical input power  $\geq 1$  kW, refer to the~~ DOAS shall comply with the fan power limitations of Section C403.8.1. DOAS total combined fan power shall include all supply, exhaust and other fans utilized for the purpose of ventilation. This fan power restriction applies to each dedicated outdoor air unit DOAS in the permitted project, but does not include the fan power associated with the zonal heating/ and cooling equipment.

$$\text{DOAS Total Combined Fan Power } \left( \frac{\text{Watts}}{\text{CFM}} \right) = \sum \left( \frac{\text{Fan bhp}}{\eta_m} \right) \times \frac{746}{\text{CFM}_{\text{supply}}} \quad (\text{Equation 4-X})$$

Where,

$\text{Fan bhp}$  = Brake horsepower for each supply, exhaust and other fan in the system at design maximum airflow rate

$\eta_m$  = Fan motor efficiency including all motor, drive and other losses for each fan in the system

$\text{CFM}_{\text{supply}}$  = Design maximum airflow rate of outdoor (supply) air

**C403.3.5.2 C403.3.5.3 Heating/ and cooling system fan controls.** Heating and cooling equipment fans, heating and cooling circulation pumps, and terminal unit fans shall cycle off and terminal unit primary cooling air shall be shut off when there is no call for heating or cooling in the zone.

**Exception:** Fans used for heating and cooling using less than 0.12 watts per cfm may operate when space temperatures are within the set point dead band (Section C403.4.1.2) to provide destratification and air mixing in the space.

**C403.3.5.3 C403.3.5.4 Decoupled DOAS supply air.** The DOAS supply air shall be delivered directly to the occupied space or downstream of the terminal heating and/or cooling coils.

Exceptions:

1. Active chilled beam systems.
2. Sensible only cooling terminal units with pressure independent variable airflow regulating devices limiting the DOAS supply air to the greater of latent load or minimum ventilation requirements.
3. Terminal heating and/or cooling units that comply with the low fan power allowance requirements in the exception of Section ~~C403.3.5.2~~ C403.3.5.3.

**C403.3.5.4 C403.3.5.5 Impracticality.** Where the code official determines that full compliance with all one or more of the requirements of in Sections C403.3.5.1 and through ~~C403.3.5.2~~ C403.3.5.4 would be is impractical, it is permissible to provide an approved alternate means of compliance that achieves a comparable level of energy efficiency as the requirement(s) deemed impractical. For the purposes of this section, impractical means that an HVAC system complying with all requirements in Section C403.3.5 cannot effectively be utilized due to an unusual use or configuration of the building.

**C406.7 High performance dedicated outdoor air system (DOAS).** A whole building, building addition or tenant space which includes a DOAS complying with Section C406.6 shall ~~also~~ provide minimum sensible effectiveness of heat recovery of 80 percent. ~~and DOAS~~ In addition to the heat recovery requirement, for a DOAS without at least one fan or fan array with fan electrical input power  $\geq 1$  kW, the total combined fan power less than shall not exceed 0.50.769 W/cfm watts per cfm of outdoor air as calculated in accordance with Section C403.3.5.2. For a DOAS with at least one fan or fan array with fan electrical input power  $\geq 1$  kW, total combined fan power shall comply with the be 80 percent or less of the fan power limitation of Section C403.8.1. ~~For the purposes of this section, DOAS total combined fan power includes~~ shall include all supply, exhaust, recirculation and other fans utilized for the purpose of ventilation.

Purpose of code change:

**This proposal incorporates various language updates and content location changes to improve code language clarity. It provides an industry recognized calculation procedure for watts per cfm and clarifies which fans are required to be included in this calculation, which is described inconsistently in the code.**

**These changes are not intended to alter existing code stringency.**

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